Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Showersave QB1-21

Registration number:	EPD-Kiwa-EE-190329-EN
Issue date:	16-04-2025
Valid until:	16-04-2030
Declaration owner:	Q-Blue
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Showersave QB1-21

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-190329-EN

1.3 VALIDITY

Issue date: 16-04-2025

Valid until: 16-04-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
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(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: Q-Blue

Address: Willem Barentszstraat 5, 7825VZ Emmen (The Netherlands)

E-mail: info@q-blue.nl

Website: https://www.q-blue.nl/

Production location: Q-Blue

Address production location: Willem Barentszstraat 5, 7825 VZ Emmen (The Netherlands)

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Anne Kees Jeeninga, Advieslab

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs

1 General information

and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

LCA method R<THINK: Ecobility Experts | EN15804+A2

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.19 (20250306)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THINK.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Showersave QB1-21' with the calculation identifier ReTHiNK-90329.

2 Product

2.1 PRODUCT DESCRIPTION

The Showersave QB1-21 XE is a waste water heat recovery system made primarily out of copper.

The Showersave QB1 series are heat exchangers that reuse the heat from the hot waste water of a shower to heat the water that runs to the heating system to be heated for that same shower. The device works according to the countercurrent exchange principle. Warm waste water from the shower runs down through a drain pipe to the sewer. There is a second pipe around this drain pipe. The water flows between these two pipes and rises to the heating device. The drain water therefore heats the separating tube and this separating tube heats the supply water on the other side. The heating device receives maximum preheated water and needs to heat up less. In this way, 65% of the normal energy consumption can be saved.

The Showersave QB1-21 XE has a weight of 7.9875kg and a length of 2.1m. The product meet the following performance requirements: BRL-K656, NEN7120, NEN1006, NTA 8800, Kiwa Watermark and Kiwa Product Certification (K95352/04), which includes certificate Hygienic aspects conform demands 4ms.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The showersave is used to retrieve energy (heat) from waste water which is flushed down the drain. The energy that is retrieved in this way is however not declared in this LCA study. This because operational energy that is declared in stage B6 only accounts for energy used for the operation of the product and not for energy that is recovered during the operational stage of the product. It is however possible to calculate an approximation of the amount of energy that is recovered. Below a sequence of formulas is given for a potential way which could be used to calculate an approximation of the energy recovery in case it is desired to know this.

Formula 1:
HH × Asd × Asw = Lpd

- **HH** = Household size (amount)
- **Asd** = Average amount of showers per person per day
- **Asw** = Average water consumption (liter) per shower
- **Lpd** = Liters water consumption per day per household

Formula 2:
Lpd × (Tdesired – Tstart) × Eneeded = Hdemand day

- **Lpd** = Liters water consumption per day per household
- **Tdesired** = Desired temperature (degrees Celsius) of shower water
- **Tstart** = Start temperature (before heating) of shower water in degrees Celsius
- **Eneeded** = Energy needed to raise 1 liter of water with 1 degree Celsius (=4.18 kJ)
- **Hdemand day** = Heat demand per day per household in kJ

Formula 3:
Hdemand day × 365 days per year = Hdemand year

- **Hdemand day** = Heat demand of one household in kJ per day
- **Hdemand year** = Heat demand of one household in kJ per year

Formula 4:
S-heat recovery × Hdemand year = Hsavings year

- **S-heat recovery** = Shower heat recovery efficiency (%)
- **Hdemand year** = Heat demand of one household per year in kJ
- **Hsavings year** = Heat savings per year in kJ

Formula 5:
Hsavings year × CO2 e-factor = CO2 savings per year

- **Hsavings year** = Heat savings per year in kJ
- **CO2 e-factor** = CO2 emission factor in kg CO2 eq. per kJ energy
- **CO2 savings per year** = CO2 savings per year in kg CO2 eq.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

For life expectansy no specific studies for the showersave are available. Further the SBR levensdurengids also did not mention anything about piping either. So no indications for the RSL could be obtained from these potential sources.

Copper pipes however are a product that have been available on the market for a long time. Various sources (Lawton tubes, Rongdy, BSXL and grassrootplumbing) named based on experiences ranges between 40-70 years as a life expectansy of a copper pipe. Furthermore the SBR levensdurengids does contain other copper products that are exposed to water like a standing seaming roof (75 years) and a copper facade (100 years). Finally the document ''Levensduren in Totem'' which is used for the EPD system in use in Belgium names copper pipes for heat distribution (RSL 40 years) and drainage pipes (50 years) in there documents. For all this reasons a life expectansy of 40 years seems to be a reasonable (worst case) assumption for the life expectansy of the product.

USED RSL (YR) IN THIS LCA CALCULATION:

40

RSL PARTS

Equal to product.

2 Product

2.4 SUBSTANCES OF VERY HIGH CONCERN

The product does not contain any substances listed in the ''Candidate List of Substances'' of Very High Concern (SVHC) for authorisation'' exceeding 0.1% of the weight of the product.

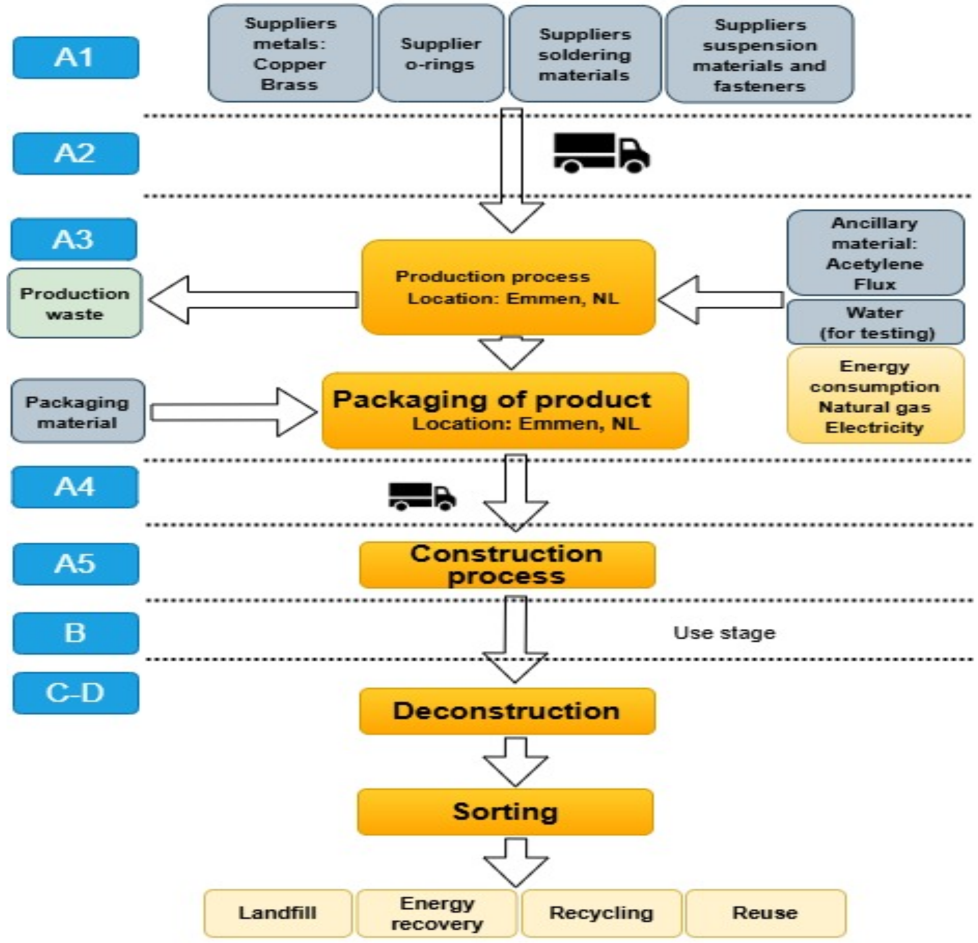
2.5 DESCRIPTION PRODUCTION PROCESS

The Showersave exists out of 3 co-centrical copper pipes, two brass connections and an inflow piece. In the outer tube two holes are stamped for the brass connections. After this the brass connections are soldered in the holes.

Next around the middle tubes copper wire is winded which is soldered at their ends. After this the middle tube is shoved into the outer tube. The ends of the tubes are then inflated so that they come up against the outer tube. These tubes are then at the point where they are inflated soldered together with each other. Now a compartment is created.

Finally the inner tube is put under tension on a CNC machine which with the help of small wheels will makes small indentations every 25mm. The inner tube is then shoved into the soldered outer and middle tube. With the help of water the earlier formed compartment is then filled with water and put under high tension. The middle tube which is the softest of all will then form itself around the inner tube (hydroforming).

After flushing the compartment is blown dry. The final product is then packaged in a cardboard box. Besides the showersave also the inlet piece (cyclone) and the mounting brackets are added. The box is then closed with recycled paper tape and is ready for shipment to the customer.



2.6 CONSTRUCTION DESCRIPTION

The packed Showersave in the box is taken/sent to the installer to the relevant location. To account for this transport in A4 a distance of 1km was defined to allow the user of this LCA-study the option to make distance and thereby the impacts for A4 specific for the situation of their actual construction location.

2 Product

On arrival of the showersave on the construction site the technician will then unpack the Showersave. He takes the two mounting brackets and drills them onto the wall of the technical room as instructed. He then takes the Showersave and positions it in the brackets, after which he tightens the brackets so that the Showersave is fixed. He then places the inflow piece (Cyclone II) on the Showersave and connects it with the shower drain pipe. The technician then connects the bottom of the Showersave to the sewer pipe.

Finally, the technician installs the sanitary water connections to the Showersave. The Showersave has therefore become part of both the fresh water connection and the drain water connection.

For A5 it was assumed that installation will take place by hand and thus there is no energy consumption since no electrical equipment is needed. For production waste a percentage of 1% was used.

3 Calculation rules

3.1 FUNCTIONAL UNIT

1 piece of shower heat recovery system

1 piece of shower heat recovery system which encompasses the pipe with heat recovery system, cyclone, shackles and other fasteners. The product is used to recover heat from the waste showerwater. This LCA is representive for the QB1-21XE system (which has a length of 2.1m and a weight of 7.9875 kg). This product has a expected life-time of 40 years and meets the following performance requirements: BRL-K656, NEN7120, NEN1006, NTA 8800, Kiwa Watermark, Kiwa Product Certification, incl. certificate Hygienic aspects conform demands 4ms).

Reference unit: piece (p)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	p
Weight per reference unit	7.988	kg
Conversion factor to 1 kg	0.125196	p

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options, modules C1-C4 and module D EPD. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	ND	ND	X	X	X	X	X	X	X

The modules of the EN15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

This EPD is representative for Showersave QB1-21, a product of Q-Blue. The results of this EPD are representative for Netherlands.

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)
All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA with the exception of the capital goods (the factory machinery of Q-Blue) and (potential) emissions from the soldering

3 Calculation rules

processes. The total neglected input and output flows is however assumed to not exceed the limit of 5% of energy use and mass or 5% on impact per environmental effect.

Regarding the machinery this is because only a few machines are used in the production process which produce a lot of products in a year. This means that the assumed low impacts of the capital goods will be spread out over a large amount of products and will stay under cut-off criteria.

Regarding the emissions associated with the soldering: no emissions are measured in the factory for this, it is not even certain that the emissions exist at all. If emissions exist no adequate environmental profiles are available to model these emissions. The only emissions available that hold the closest resemblance are those named in the Ecoinvent environmental profiles for welding of steel. In the case of Showersave however the material is different (copper not steel) and it isn't welded but soldered. It is thus questionable whether these environmental profiles for welding of steel adequately represent the type of emissions of soldering copper since part of the emissions of soldering will also depend on the material type that is soldered and as named a different process is used. If they would be representative enough though it would show the emissions would stay well below cut-off because the impact is really low compared to the total product and the surface that has to be soldered is also extremely low.

Construction process stage (A4-A5)
All input flows (e.g. transportation to the construction site, additional raw material use for construction, installation energy (use)of energy use for assembly , etc.) and output flows (e.g. construction waste, packaging waste, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass or 5% on impact per environmental effect.

Use stage (B1-B3)
No activities take place in phases B1-B3. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass or 5% on impact per environmental effect.

End of life stage (C1-C4)
All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. Regarding energy use for demolition no values were included in this LCA since it was assumed that demolition will take place manually. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass or 5% on impact per environmental effect.

Benefits and loads beyond the system boundary (Module D)
All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

3.6 ALLOCATION

Allocation has not been applied in this LCA.

3.7 DATA COLLECTION & REFERENCE PERIOD

Raw materials composition: 2023
Recycled content percentages: 2020
Suppliers: 2023
Energy Consumption: 2023
Production waste: estimate made in 2024 based on previous production
Emissions: n.a.

3.8 DATA QUALITY

Foreground data is not older 5 years. For background data ecoinvent 3.6 is used, this is typically not older then 10 years.

3.9 POWER MIX

The residual power mix of the Netherlands was used for electricity. The following ecoinvent profile was used to represent the power mix: *Electricity, low voltage {NL}| electricity, low voltage, residual mix | Cut-off, U.* This environmental profile holds a GWP-total 0.482811190111415 kg CO2 per kWh.

4 Scenarios and additional technical information

4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

For the transport from production place to assembly/user, the following scenario is assumed for module A4 of this EPD.

	Value and unit
Vehicle type used for transport	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Distance	1 km
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.2 ASSEMBLY (A5)

The following information describes the scenarios for flows entering the system and flows leaving the system at module A5.

FLOWS ENTERING THE SYSTEM

There are no significant environment impacts as a result of materials or energy used in the construction stage (A5).

FLOWS LEAVING THE SYSTEM

The following output flows leaving the system at module A5 are assumed.

Description	Value	Unit
Output materials as result of loss during construction	1	%
Output materials as result of waste processing of materials used for installation/assembly at the building site	0.000	kg
Output materials as result of waste processing of used packaging	0.090	kg

4.3 USE STAGE (B1)

No significant environment impact in the use stage modules, because there is no (significant) emission to air, soil or water.

4.4 MAINTENANCE (B2)

For maintenance no input or output flows are moddeled.

4 Scenarios and additional technical information

4.5 REPAIR (B3)

Repairs are not applicable within the functional unit and to achieve the reference service life.

4.6 OPERATIONAL ENERGY USE (B6)

Description	Service cycle (yr)	Number of cycles (n)	Amount per cycle	Total Amount	Unit

4.7 OPERATIONAL WATER USE (B7)

Description	Service cycle (yr)	Number of cycles (n)	Amount per cycle	Total Amount	Unit

4.8 DE-CONSTRUCTION, DEMOLITION (C1)

No inputs are needed for the product at the de-construction / demolition phase

4.9 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
(ei3.6) copper (i.a. sheets, pipes) (NMD ID 41)	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
(ei3.6) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
(ei3.6) elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
(ei3.6) Steel, construction profiles (NMD ID 70)	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
		0	100	150	50	0

4 Scenarios and additional technical information

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
(ei3.6) Zinc / zinc coating galvanised steel (i.a. profiles, sheets, zinc coating) (NMD ID 75)	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)					
(ei3.6) plastics, via residue (NMD ID 43)	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	(ei3.6) Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.10 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables. First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
(ei3.6) copper (i.a. sheets, pipes) (NMD ID 41)	NL	0	5	0	95	0
(ei3.6) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	NL	0	10	85	5	0
(ei3.6) elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	NL	0	10	85	5	0
(ei3.6) Steel, construction profiles (NMD ID 70)	NL	0	1	0	94	5
(ei3.6) Zinc / zinc coating galvanised steel (i.a. profiles, sheets, zinc coating) (NMD ID 75)	NL	0	5	0	95	0
(ei3.6) plastics, via residue (NMD ID 43)	NL	0	20	80	0	0

4 Scenarios and additional technical information

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
(ei3.6) copper (i.a. sheets, pipes) (NMD ID 41)	0.000	0.385	0.000	7.322	0.000
(ei3.6) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.000	0.008	0.066	0.004	0.000
(ei3.6) elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	0.000	0.000	0.000	0.000	0.000
(ei3.6) Steel, construction profiles (NMD ID 70)	0.000	0.002	0.000	0.179	0.009
(ei3.6) Zinc / zinc coating galvanised steel (i.a. profiles, sheets, zinc coating) (NMD ID 75)	0.000	0.001	0.000	0.009	0.000
(ei3.6) plastics, via residue (NMD ID 43)	0.000	0.000	0.002	0.000	0.000
Total	**0.000**	**0.396**	**0.068**	**7.514**	**0.009**

4.11 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
(ei3.6) copper (i.a. sheets, pipes) (NMD ID 41)	4.001	0.000
(ei3.6) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.004	1.522
(ei3.6) elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	0.000	0.012
(ei3.6) Steel, construction profiles (NMD ID 70)	0.154	0.000
(ei3.6) Zinc / zinc coating galvanised steel (i.a. profiles, sheets, zinc coating) (NMD ID 75)	0.009	0.000
(ei3.6) plastics, via residue (NMD ID 43)	0.000	0.000
Total	**4.169**	**1.533**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER PIECE

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	1.79E+1	4.35E-1	2.69E+0	2.10E+1	1.09E-3	3.70E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.75E-2	3.65E-1	4.69E-3	-7.13E+0
GWP-f	kg CO_2 eq.	1.78E+1	4.35E-1	2.83E+0	2.10E+1	1.09E-3	2.20E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.74E-2	3.64E-1	4.69E-3	-7.09E+0
GWP-b	kg CO_2 eq.	7.56E-2	1.75E-4	-1.46E-1	-6.98E-2	4.39E-7	1.49E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.31E-5	7.63E-4	5.57E-6	-4.02E-2
GWP-luluc	kg CO_2 eq.	8.33E-2	1.60E-4	3.84E-3	8.73E-2	4.00E-7	8.78E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.11E-5	2.17E-4	1.02E-6	-6.64E-3
ODP	kg CFC 11 eq.	1.37E-6	9.60E-8	1.63E-7	1.62E-6	2.41E-10	1.77E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.27E-8	3.15E-8	1.28E-9	-5.51E-7
AP	mol H+ eq.	5.09E-1	2.52E-3	1.15E-2	5.23E-1	6.32E-6	5.30E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.33E-4	2.27E-3	3.10E-5	-2.96E-1
EP-fw	kg P eq.	6.62E-3	4.38E-6	1.29E-4	6.76E-3	1.10E-8	6.79E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.79E-7	1.29E-5	4.63E-8	-2.37E-3
EP-m	kg N eq.	5.15E-2	8.89E-4	2.18E-3	5.45E-2	2.23E-6	5.67E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.17E-4	5.05E-4	1.16E-5	-2.77E-2
EP-T		7.59E-1	9.80E-3	2.50E-2	7.94E-1	2.46E-5	8.18E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.29E-3	5.85E-3	1.27E-4	-4.27E-1

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
	mol N eq.																
POCP	kg NMVOC eq.	1.73E-1	2.80E-3	7.07E-3	1.82E-1	7.01E-6	1.89E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.69E-4	1.60E-3	3.64E-5	-9.49E-2
ADP-mm	kg Sb-eq.	1.17E-2	1.10E-5	4.72E-5	1.18E-2	2.76E-8	1.19E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.46E-6	1.03E-5	3.14E-8	-5.60E-3
ADP-f	MJ	2.25E+2	6.56E+0	3.70E+1	2.68E+2	1.64E-2	2.79E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.66E-1	2.64E+0	9.51E-2	-8.99E+1
WDP	m3 world eq.	1.53E+1	2.35E-2	2.54E+0	1.78E+1	5.88E-5	1.79E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.10E-3	3.45E-2	5.38E-4	-5.99E+0

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
PM	disease incidence	1.96E-6	3.90E-8	8.34E-8	2.09E-6	9.77E-11	2.18E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.15E-9	2.82E-8	6.38E-10	-1.07E-6
IR		1.04E+0	2.75E-2	7.52E-2	1.14E+0	6.89E-5	1.19E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.63E-3	1.30E-2	4.72E-4	-4.17E-1

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
	kBq U235 eq.																
ETP-fw	CTUe	8.45E+3	5.85E+0	5.30E+1	8.51E+3	1.47E-2	8.57E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.72E-1	1.31E+1	4.50E-1	-5.29E+3
HTP-c	CTUh	1.68E-7	1.90E-10	1.03E-9	1.69E-7	4.76E-13	1.71E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.51E-11	2.97E-10	4.36E-12	-1.16E-7
HTP-nc	CTUh	1.15E-5	6.41E-9	4.39E-8	1.15E-5	1.61E-11	1.16E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.47E-10	1.32E-8	3.52E-10	-8.36E-6
SQP	Pt	1.96E+2	5.69E+0	1.68E+1	2.19E+2	1.43E-2	2.28E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.51E-1	5.09E+0	2.33E-1	-9.73E+1

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2

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ILCD classification	Indicator	Disclaimer
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
PERE	MJ	5.05E+1	8.21E-2	4.82E+0	5.54E+1	2.06E-4	5.62E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.08E-2	4.07E-1	5.27E-3	-2.95E+1
PERM	MJ	0.00E+0	0.00E+0	1.43E+0	1.43E+0	0.00E+0	1.43E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	5.05E+1	8.21E-2	6.25E+0	5.68E+1	2.06E-4	5.76E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.08E-2	4.07E-1	5.27E-3	-2.95E+1
PENRE	MJ	2.37E+2	6.96E+0	3.91E+1	2.83E+2	1.75E-2	2.94E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.20E-1	2.80E+0	1.01E-1	-9.55E+1
PENRM	MJ	1.80E+0	0.00E+0	8.46E-3	1.81E+0	0.00E+0	1.81E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.13E-1
PENRT	MJ	2.39E+2	6.96E+0	3.92E+1	2.85E+2	1.75E-2	2.96E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.20E-1	2.80E+0	1.01E-1	-9.57E+1
SM	Kg	3.35E+0	0.00E+0	1.88E-2	3.37E+0	0.00E+0	3.37E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw materials | **PERM**=Use of renewable primary energy resources used as raw materials | **PERT**=Total use of renewable primary energy resources | **PENRE**=Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | **PENRM**=Use of non-renewable primary energy resources used as raw materials | **PENRT**=Total use of non-renewable primary energy resources | **SM**=Use of secondary material | **RSF**=Use of renewable secondary fuels | **NRSF**=Use of non-renewable secondary fuels | **FW**=Net use of fresh water

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	4.08E-1	7.99E-4	6.73E-2	4.76E-1	2.00E-6	4.81E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.06E-4	1.46E-3	1.18E-4	-1.51E-1

PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw materials | **PERM**=Use of renewable primary energy resources used as raw materials | **PERT**=Total use of renewable primary energy resources | **PENRE**=Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | **PENRM**=Use of non-renewable primary energy resources used as raw materials | **PENRT**=Total use of non-renewable primary energy resources | **SM**=Use of secondary material | **RSF**=Use of renewable secondary fuels | **NRSF**=Use of non-renewable secondary fuels | **FW**=Net use of fresh water

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
HWD	Kg	1.98E-3	1.66E-5	6.88E-5	2.06E-3	4.17E-8	2.09E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.20E-6	7.82E-6	1.18E-7	-2.22E-4
NHWD	Kg	8.08E+0	4.16E-1	1.96E-1	8.69E+0	1.04E-3	1.18E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.49E-2	1.45E-1	3.97E-1	-5.29E+0
RWD	Kg	9.69E-4	4.32E-5	5.69E-5	1.07E-3	1.08E-7	1.13E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.70E-6	1.53E-5	6.26E-7	-3.84E-4

HWD=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	4.75E-5	4.75E-5	0.00E+0	9.55E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.50E-3	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	4.17E-2	4.17E-2	0.00E+0	1.44E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.51E+0	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	2.38E-3	2.38E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.92E-1
EEE	MJ	0.00E+0	0.00E+0	1.38E-3	1.38E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.44E-1

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy, Thermic | **EEE**=Exported Energy, Electric

5 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER PIECE

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per piece:

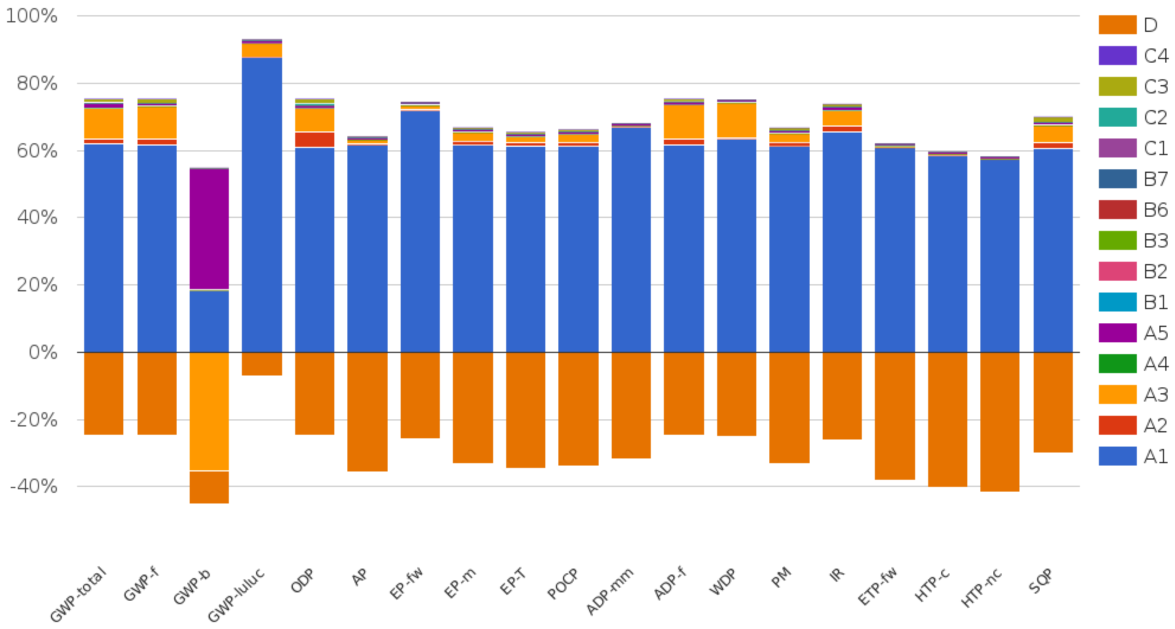
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.04091	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	0.15	kg CO2 (biogenic)

6 Interpretation of results



Major impacts are in the Modules A1, A3 and D. These are logical impacts because of the raw materials mainly consisting of metals having a high impact in A1. Further the adaptations made by Q-Blue in A3 which also have a considerable impact and finally EoL of the mainly metal materials which due to recycling leads to getting back a significant part of the original environmental impact as a benefit in Module D.

7 References

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ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

ISO 14025
ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A1
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EN 15804+A2
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NMD-verification protocol
NMD-verification protocol version 1.0, July 2020, foundation NMD

NMD Determination method
NMD Determination method Environmental performance Construction works v1.1 March 2022, foundation NMD

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Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

Totem
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Lawton Tubes
https://lawtontubes.co.uk/nl/pipe-wars-copper-vs-plastic/

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https://bsxl.nl/radiatoren/installatiemateriaal/leidingwerk/koperen-buizen#:~:text=Koperen%20buizen%20bieden%20tal%20van,een%20investering%20die%20zichzelf%20terugbetaalt

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7 References

SBR
Levensduur van bouwproducten (2011)

8 Contact information

Publisher	Operator	Owner of declaration
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Kiwa-Ecobility Experts is established member of the ECO PLATFORM